Board of Adjustment
Case Report

City of Raleigh
Department of City Planning
One Exchange Plaza
Raleigh, NC 27601
(919) 996-2682
www.raleighnc.gov

Case File: **A-135-17**

Property Address: 4700 Riverwood Circle

Property Owner: Crabtree Apartments, LLC

Project Contact: Mack Paul

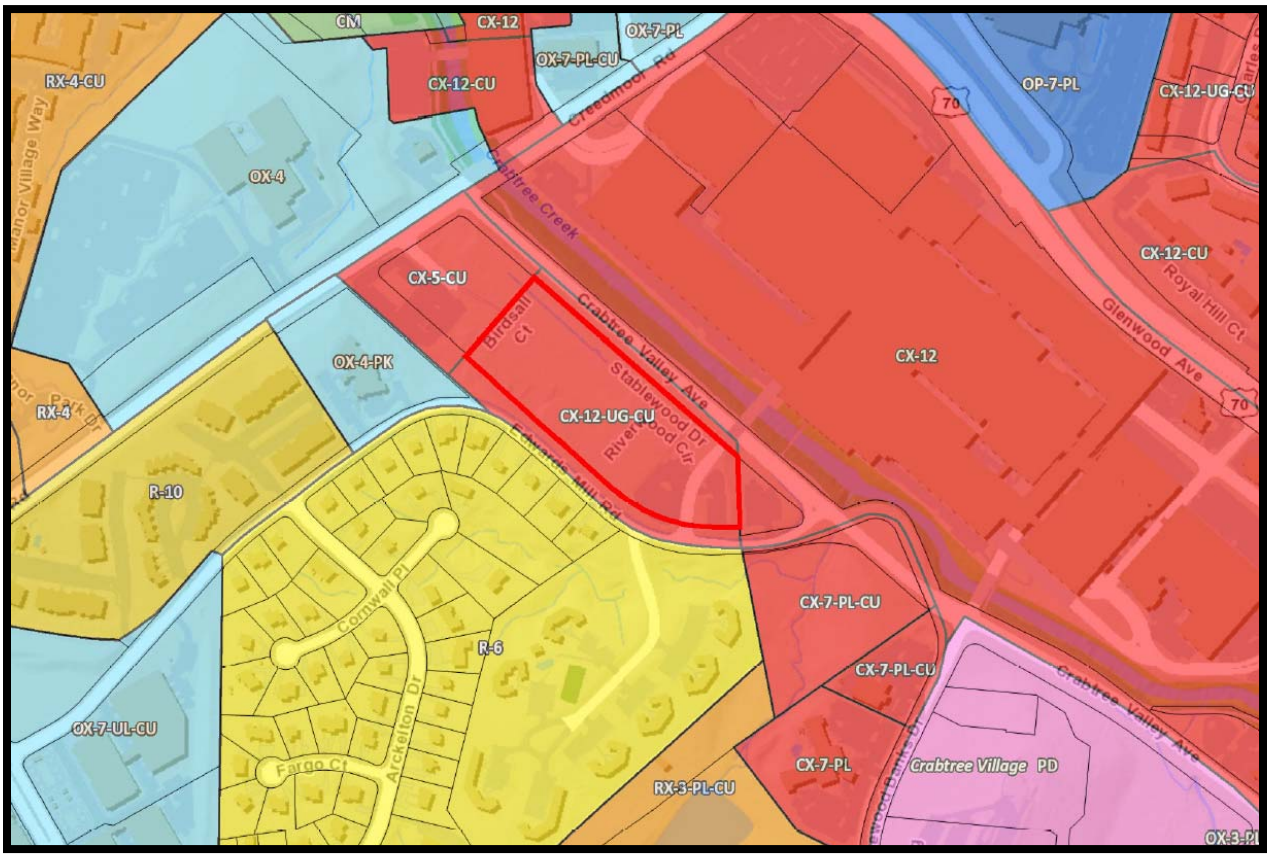
Nature of Case: A request for complete relief from Section 7.2.5.D.4. of the Unified Development Ordinance in order to permit unscreened ground mounted mechanical equipment on a 7.11 acre site zoned Commercial Mixed-Use-12 Urban General Conditional Use and located at 4700 Riverwood Circle.

4700 Riverwood Circle – Location Map

To BOA: 12-11-17

Staff Coordinator: Eric S. Hodge, AICP

ZONING DISTRICTS: Commercial Mixed-Use-12-Urban General Conditional Use



4700 Riverwood Circle – Zoning Map

Z-9-11 Conditional Use – Creedmoor Road - located on the east side, southeast of its intersection with Crabtree Valley, being Wake County PINs 0796302996, 0796308642, and 0796314150. Approximately 11.74 acres to be rezoned from Shopping Center (0.81 acre) and SC with (PDD) Planned Development District and (PBOD) Pedestrian Business Overlay District (10.93 acres) to SC CUD with PBOD (8.126 acres), and SC CUD (3.613 acres).
Conditions Dated: 8/15/11

Narrative or conditions being requested:
For the purposes of the following conditions, Property" shall refer to tax parcels (PINs) 0796-30-2996, 0796-30-8642, and 0796-31-4150.

(a) The following uses shall be prohibited upon the Property: automotive service and repair facility; utility service and substation; emergency shelter Type A or Type B; landfill; manufacturing-custom; manufacturingspecialized;

adult establishment; kennel/cattery; riding stable; correctional/penal facility; and outdoor stadium, outdoor theater or outdoor racetrack.

(b) With the exception of Hotel/Motel, an allowed use upon the Property, all uses developed upon the Property that are categorized as "Commercial" in the Schedule of Permitted Land Uses attached hereto as Exhibit C-1 shall not exceed 200,000 square feet floor area gross.

(c) All uses developed upon the Property that are characterized as Institution/Civic/Services or Office in the Schedule of Permitted Land Uses attached hereto as Exhibit C-1 shall not exceed 100,000 square feet floor area gross.

(d) Uses developed upon the Property that are characterized as Residential in the Schedule of Permitted Land Uses attached hereto as Exhibit C-1 shall not exceed 575 dwelling units.

(e) Within fifteen (15) days following the approval of the form and substance of the restrictive covenant hereinafter mentioned by the City Attorney or his or her deputy, the owner of the Property shall cause to be recorded in the Wake County Registry a restrictive covenant that allocates allowable development upon the Property as provided in the foregoing conditions (b), (c), and (d) among all existing lots of record comprising the Property. Such restrictive covenant shall be submitted to the City Attorney within thirty (30) days following approval of this zoning case by the City Council and shall be approved by the City Attorney or his or her deputy prior to recordation. Such restrictive covenant shall provide that it shall become null and void and of no effect whatsoever in the event that a court enters a final judgment (not subject to appeal) declaring the rezoning resulting from the approval of this case invalid. The restrictive covenant and the allocation of development set forth therein may be amended from time to time following recordation. Any such amendment shall require the written concurrence of the owner(s) of all portions of the Property affected by the amendment and shall be at the sole discretion of such owner(s). Following recordation a copy of each amendment shall be mailed to the Planning Director at P.O. Box 590, Raleigh, NC. 27602.

(f) The land use or uses developed upon the Property shall be limited to a use or uses which when analyzed using the Trip Generation Manual published by the Institute of Transportation Engineers will generate no more than 12,947 daily vehicle trips with no more than 705 vehicle trips in the AM peak hour and no more than 934 vehicle trips in the PM peak hour.

(g) Upon development of Section 1 of the Property as shown on Exhibit B-1 of the Petition in this case, a means shall be provided for pedestrian connectivity from the then existing grade of Section 1 to the grade of Crabtree Valley Avenue as it is now located between the Property and Crabtree Valley Mall (PIN 0796-50-2569).

(h) The actual location of the "Crabtree Valley Mall Connector Road" shown on pages 4 and 16 of the Streetscape and Parking Plan in this case will be established at the time of site plan approval.

(i) Along the Creedmoor Road frontage of the Property, parking between the street right-of-way and the building(s) shall not exceed two rows of parking.

(j) Upon approval of a site plan or plans for the development of all or a portion of the Property, if requested by the City's Transit Division, the owner shall dedicate

a transit easement approved by the Raleigh City Attorney upon the respective site or sites of a size, nature and location acceptable to such Division and provide any improvements, such as a bench and/or shelter, specified by such Division that shall be in accordance with its standard policies. The owner shall dedicate up to three (3) transit easements upon the Property.

(k) Upon development of Section 3 of the Property as shown on Exhibit B-1 of the Petition in this case, pedestrian connectivity shall be provided between such Section and the adjoining Section 2. With regard to sidewalks along public rights of way, the design of sidewalk sections and curb and sidewalk details for Section 3 shall be coordinated with such design for Sections 1 and 2, although to the extent allowed by the City's Ordinances, sidewalk widths may be reduced for Section 3. Plants planted along public rights of way in Section 3 shall be consistent with those utilized for such purpose in Sections 1 and 2.

VARIANCE STANDARDS: In accordance with UDO §10.2.10 Variance, before a variance request is granted, the Board of Adjustment shall show all of the following:

1. Unnecessary hardship would result from the strict application of the ordinance. It shall not be necessary to demonstrate that, in the absence of the variance, no reasonable use can be made of the property.

2. The hardship results from conditions that are peculiar to the property, such as location, size or topography. Hardships resulting from personal circumstances, as well as hardships resulting from conditions that are common to the neighborhood or the general public, may not be the basis for granting a variance.

3. The hardship did not result from actions taken by the applicant or the property owner. The act of purchasing property with knowledge that circumstances exist that may justify the granting of a variance shall not be regarded as a self-created hardship.

4. The requested variance is consistent with the spirit, purpose and intent of the ordinance, such that public safety is secured and substantial justice is achieved.

Setback Standards: The subject property is zoned CX-12-UG-CU

Yard Type	Minimum Setback
Front Yard	0'
Side Street	0'
Side	0'
Rear	0'

Sec. 7.2.5.D.4. Ground-Mounted Equipment

a. Ground-mounted equipment screening shall be as high as the highest point of the equipment being screened.

b. Screening shall consist of landscaping or an opaque screen compatible with the principal building in terms of texture, quality, material and color.

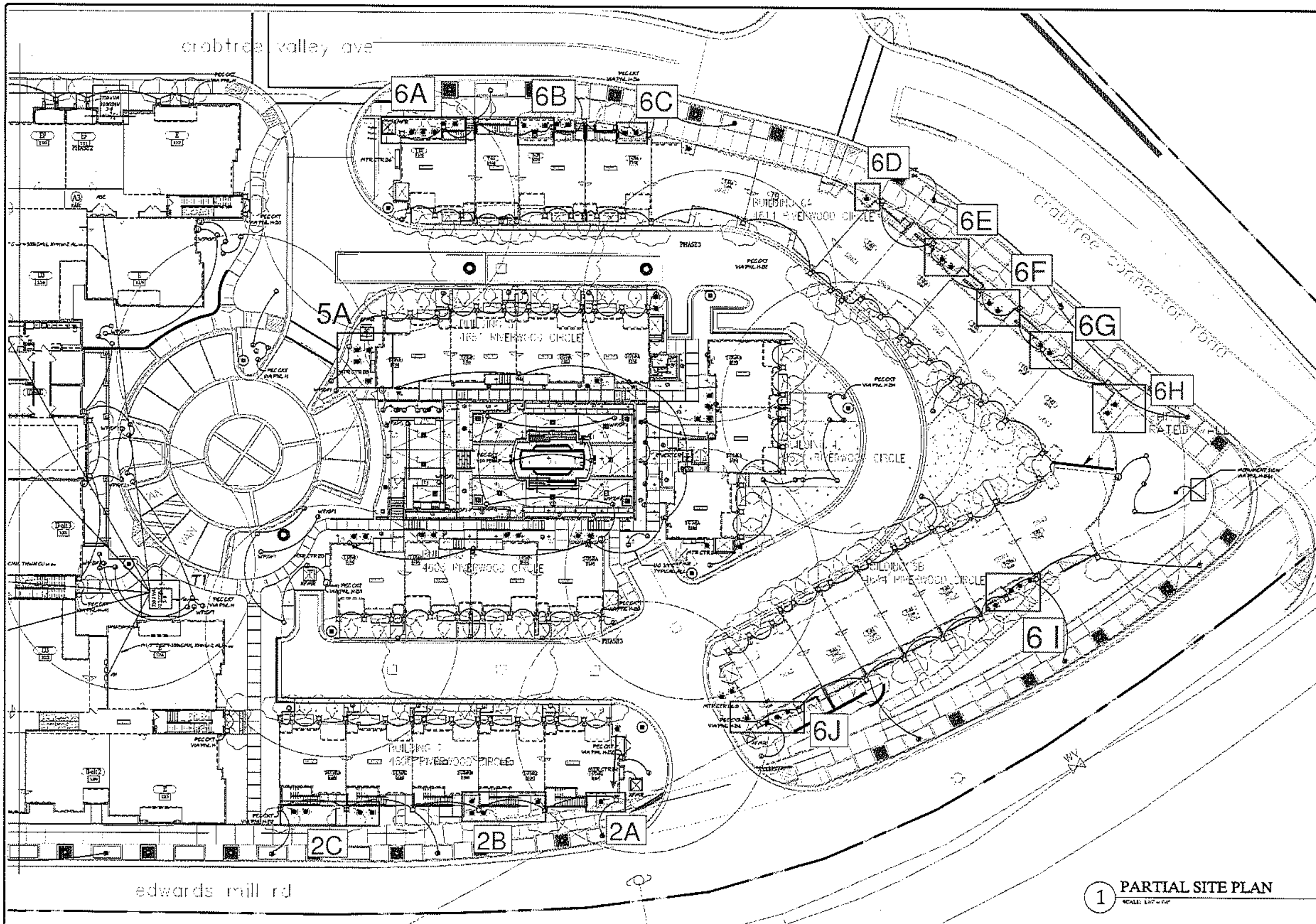
Application for Variance

RCP RALEIGH DEPARTMENT OF CITY PLANNING

Department of City Planning | 1 Exchange Plaza, Suite 300 | Raleigh, NC 27601 | 919-996-2626
Submit application to: Development Services Customer Service Center, 1 Exchange Plaza, Suite 400, Raleigh, NC 27601

NATURE OF REQUEST	OFFICE USE ONLY
Nature of variance request (if more space is needed, submit addendum on separate sheet): The Applicant requests a variance to section 7.2.5.D.4 of the UDO to accommodate a building which was recently approved, permitted, constructed, and issued a certificate of occupancy in a manner which is noncompliant with the screening requirements for ground-mounted equipment.	**Transaction Number** A-135-17
Provide all previous transaction numbers for Coordinated Team Reviews, Due Diligence Sessions, or Pre-Submittal Conferences. If this property was the subject of a previous variance request, provide the case number.	

GENERAL INFORMATION		
Property Address: 4700 Riverwood Circle		**Date:** 11/10/17
Property Pin: 0796-30-9595	**Current Zoning:** CX-12-UG-CU	
Nearest Intersection: Riverwood Circle at Crabtree Valley Avenue		**Property size (in acres)** 7.11
Property Owner: Crabtree Apartments, LLC	**Phone:** 713.683.4818	**Fax:** 713.683.9574
Owner's Mailing Address 1400 Post Oak Blvd | Ste 500 Houston, TX 77056	**Email:** daniel@mfein.com	
Project Contact Person: Mack Paul	**Phone:** 919-590-0377	**Fax:** 919-882-8890
Contact Person's Mailing Address 421 Fayetteville St |Ste 530 Raleigh, NC 27601	**Email:** mpaul@morningstarlawgroup.com	
Notary Sworn and subscribed before me this 11th day of NOVEMBER, 2017 CRABTREE APARTMENTS, LLC BY: MFCT LLC BY: DANIEL FEIN AGENT FOR SOLE MEMBER	**Notary Signature and Seal** Harris County 11/11/2017 REHANA ABBASI My Notary ID # 129437616 Expires June 1, 2021	



1 PARTIAL SITE PLAN

HGE CONSULTING, INC.
MEP ENGINEERS
15603 GLEN CHASE
HOUSTON, TEXAS 77095
PHONE: 281-858-7602
FAX: 281-856-2430
EMAIL:
MEP@HGECONSULTING.COM

NUMBER	DATE	REVISION	BY
1	04/15/2014	ELECTRIC SERVICE LOCATIONS	JHH
2	04/18/2014	VJMS REVISION	JW
	10/02	ISSUED FOR CONSTRUCTION	KM

CRABTREE COMMONS
RALEIGH, NORTH CAROLINA

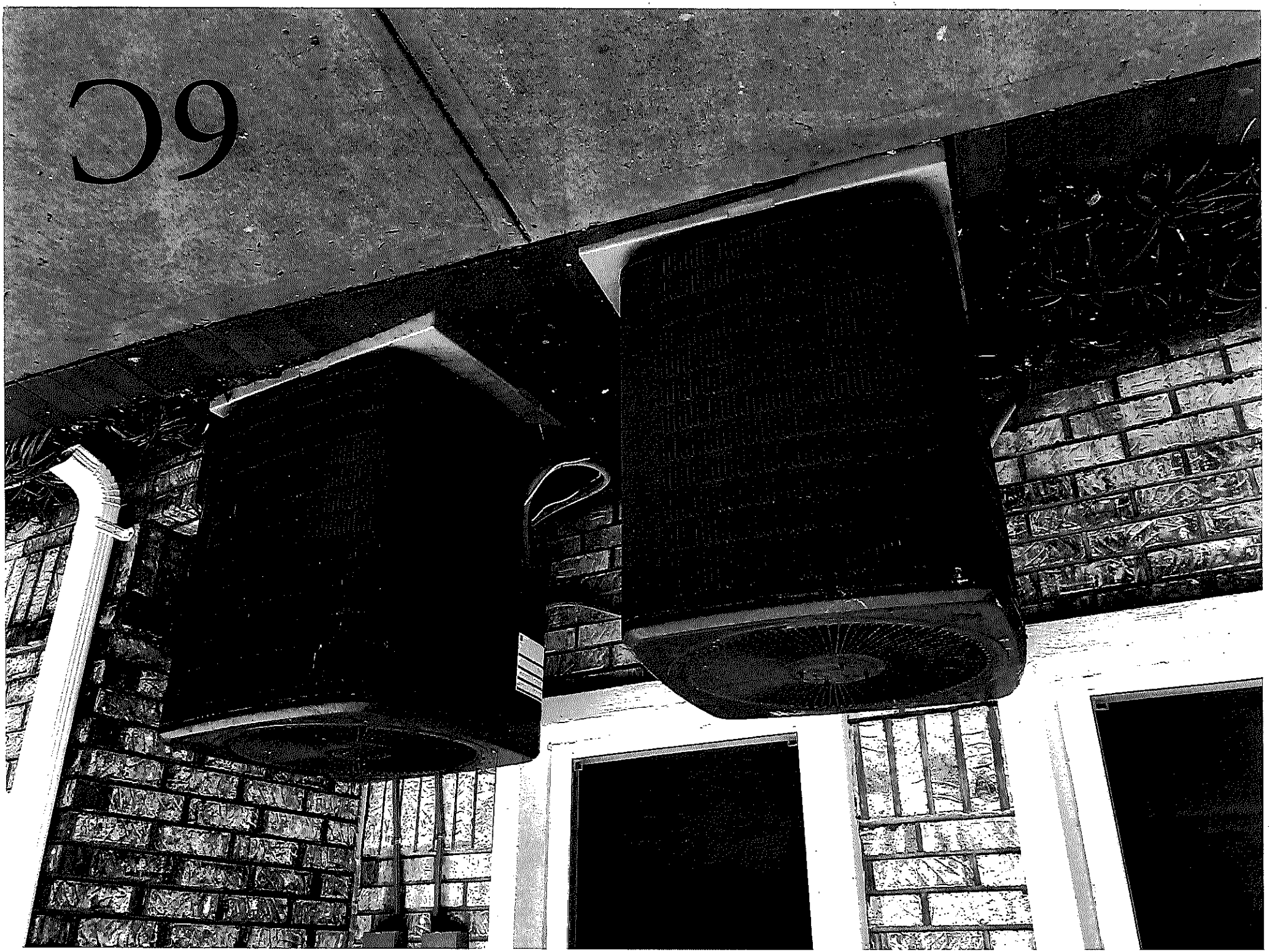
NORTH CAROLINA
SEAL
031750
ENGINEER
JAIRZINHO VASQUEZ

○ FINAL COORDINATION
○ PERMIT ISSUE
● CONSTRUCTION ISSUE

DRAWN BY:	JW
DATE:	10/09/2014
CHK'D BY:	JV
JOB:	e52-12

E-1.2


Goodman
Goodman
6B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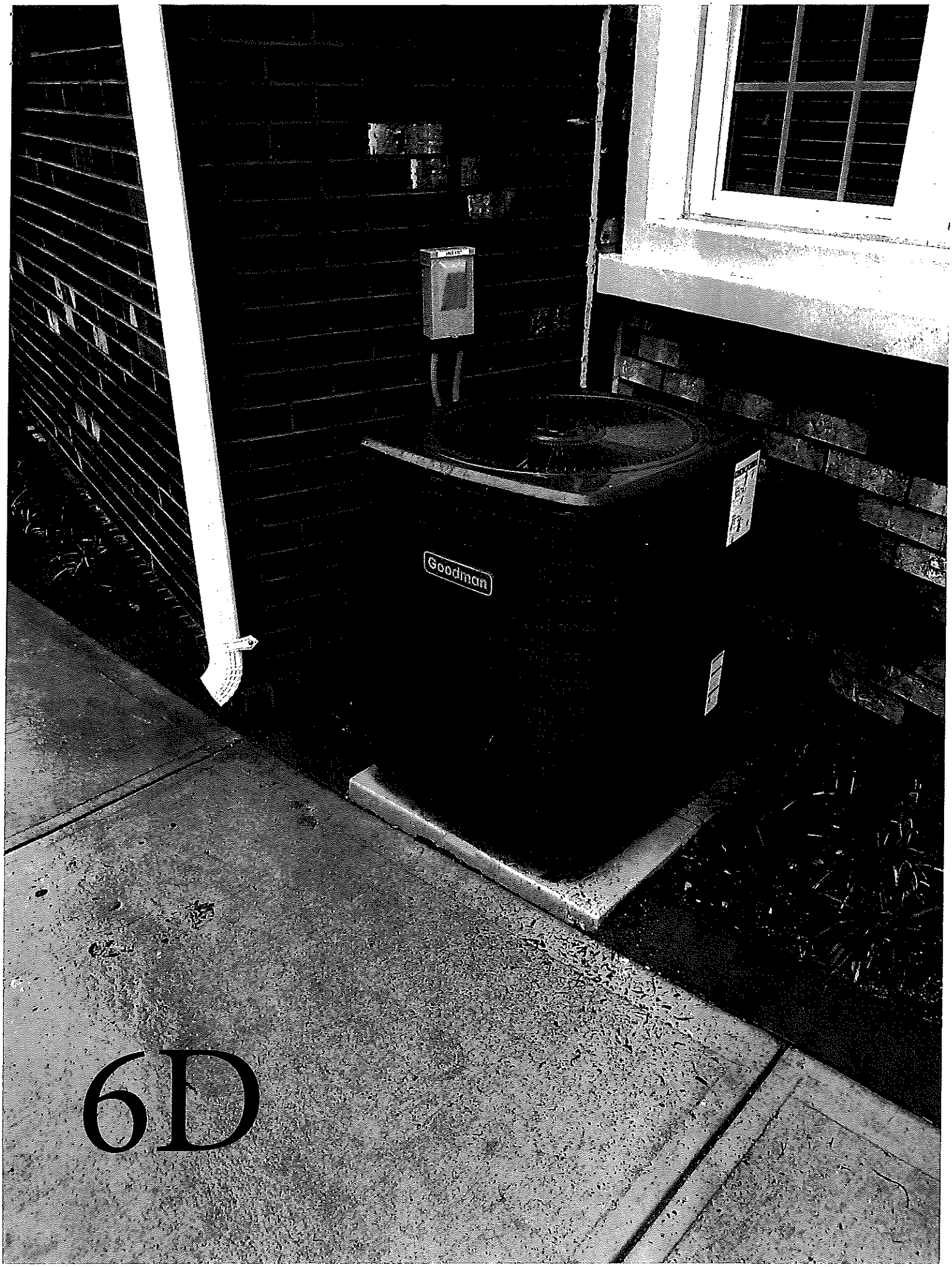


6D

6E


Goodman
6F


Goodman
6G


6T

CONDENSING UNIT

AIR CONDITIONING
INSTALLATION & SERVICE REFERENCE

5151 San Felipe, Suite 500, Houston, TX 77056
www.goodmanmfg.com -or- www.amana-hac.com
P/N: IO-258R Date: September 2013

Important Safety Instructions

The following symbols and labels are used throughout this manual to indicate immediate or potential safety hazards. It is the owner's and installer's responsibility to read and comply with all safety information and instructions accompanying these symbols. Failure to heed safety information increases the risk of personal injury, property damage, and/or product damage.

⚠ WARNING

HIGH VOLTAGE!
Disconnect ALL power before servicing.
Multiple power sources may be present.
Failure to do so may cause property damage, personal injury or death.

⚠ WARNING

ONLY individuals meeting the requirements of an "Entry Level Technician", at a minimum, as specified by the Air Conditioning, Heating and Refrigeration Institute (AHRI) may use this information. Attempting to install or repair this unit without such background may result in product damage, personal injury, or death.

Shipping Inspection

Always keep the unit upright; laying the unit on its side or top may cause equipment damage. Shipping damage, and subsequent investigation is the responsibility of the carrier. Verify the model number, specifications, electrical characteristics, and accessories are correct prior to installation. The distributor or manufacturer will not accept claims from dealers for transportation damage or installation of incorrectly shipped units.

Codes & Regulations

This product is designed and manufactured to comply with national codes. Installation in accordance with such codes and/or prevailing local codes/regulations is the responsibility of the installer. The manufacturer assumes no responsibility for equipment installed in violation of any codes or regulations. Rated performance is achieved after 72 hours of operation. Rated performance is delivered at the specified airflow. See outdoor unit specification sheet for split system models or product specification sheet for packaged and light commercial models. Specification sheets can be found at www.goodmanmfg.com for Goodman® brand products or www.amana-hac.com for Amana® brand products. Within either website, please select the residential or commercial products menu and then select the submenu for the type of product to be installed, such as air conditioners or heat pumps, to access a list of product pages that each contain links to that model's specification sheet.

The United States Environmental Protection Agency (EPA) has issued various regulations regarding the introduction and disposal of refrigerants. Failure to follow these regulations may harm the environment and can lead to the imposition of substantial fines. Should you have any questions please contact the local office of the EPA.

If replacing a condensing unit or air handler, the system must be manufacturer approved and Air Conditioning, Heating and Refrigeration Institute (AHRI) matched. **NOTE:** Installation of unmatched systems is strongly discouraged.

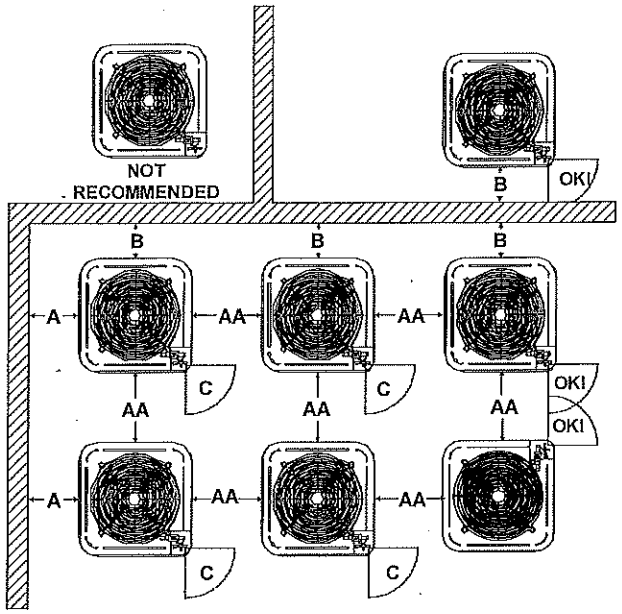
Outdoor units are approved for operation above 55°F in cooling mode. Operation below 55°F requires the use of an approved low ambient kit.

Operating the unit in a structure that is not complete (either as part of new construction or renovation) will void the warranty.

Installation Clearances

Special consideration must be given to location of the condensing unit(s) in regard to structures, obstructions, other units, and any/all other factors that may interfere with air circulation. Where possible, the top of the unit should be completely unobstructed; however, if vertical conditions require placement beneath an obstruction **there should be a minimum of 60 inches between the top of the unit and the obstruction(s).** The specified dimensions meet requirements for air circulation only. Consult all appropriate regulatory codes prior to determining final clearances.

Another important consideration in selecting a location for the unit(s) is the angle to obstructions. Either side adjacent the valves can be placed toward the structure provided the side away from the structure maintains minimum service clearance. Corner installations are strongly discouraged.



Minimum Airflow Clearance				
Model Type	A	B	C	AA
Residential	10"	10"	18"	20"
Light Commercial	12"	12"	18"	24"

This unit can be located at ground floor level or on flat roofs. At ground floor level, the unit must be on a solid, level foundation that will not shift or settle. To reduce the possibility of sound transmission, the foundation slab should not be in contact with or be an integral part of the building foundation. Ensure the foundation is sufficient to support the unit. A concrete slab raised above ground level provides a suitable base.

Rooftop Installations

If it is necessary to install this unit on a roof structure, ensure the roof structure can support the weight and that proper consideration is given to the weather-tight integrity of the roof. Since the unit can vibrate during operation, sound vibration transmission should be considered when installing the unit. Vibration absorbing pads or springs can be installed between the condensing unit legs or frame and the roof mounting assembly to reduce noise vibration.

⚠ WARNING

To avoid possible injury, explosion or death, practice safe handling of refrigerants.

Safe Refrigerant Handling

While these items will not cover every conceivable situation, they should serve as a useful guide.

⚠ WARNING

Refrigerants are heavier than air. They can "push out" the oxygen in your lungs or in any enclosed space. To avoid possible difficulty in breathing or death:

- **Never purge refrigerant into an enclosed room or space. By law, all refrigerants must be reclaimed.**
- **If an indoor leak is suspected, thoroughly ventilate the area before beginning work.**
- **Liquid refrigerant can be very cold. To avoid possible frostbite or blindness, avoid contact and wear gloves and goggles. If liquid refrigerant does contact your skin or eyes, seek medical help immediately.**
- **Always follow EPA regulations. Never burn refrigerant, as poisonous gas will be produced.**

⚠ WARNING

To avoid possible explosion:

- **Never apply flame or steam to a refrigerant cylinder. If you must heat a cylinder for faster charging, partially immerse it in warm water.**
- **Never fill a cylinder more than 80% full of liquid refrigerant.**
- **Never add anything other than R-22 to an R-22 cylinder or R-410A to an R-410A cylinder. The service equipment used must be listed or certified for the type of refrigerant used.**
- **Store cylinders in a cool, dry place. Never use a cylinder as a platform or a roller.**

⚠ WARNING

To avoid possible explosion, use only returnable (not disposable) service cylinders when removing refrigerant from a system.

- **Ensure the cylinder is free of damage which could lead to a leak or explosion.**
- **Ensure the hydrostatic test date does not exceed 5 years.**
- **Ensure the pressure rating meets or exceeds 400 lbs.**

When in doubt, do not use cylinder.

Refrigerant Lines

⚠ CAUTION

The compressor POE oil for R-410A units is extremely susceptible to moisture absorption and could cause compressor failure. Do not leave system open to atmosphere any longer than necessary for installation.

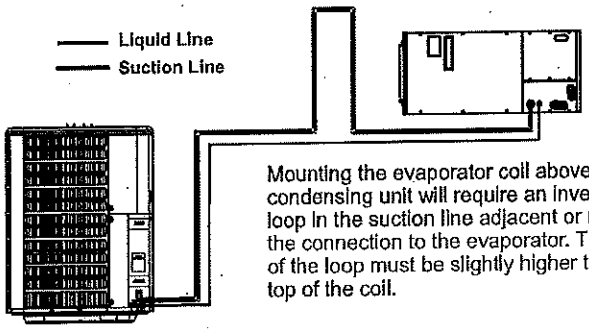
Use only refrigerant grade (dehydrated and sealed) copper tubing to connect the condensing unit with the indoor evaporator. After cutting the tubing, install plugs to keep refrigerant tubing clean and dry prior to and during installation. Tubing should always be cut square keeping ends round and free from burrs. Clean the tubing to prevent contamination.

Do NOT let refrigerant lines come in direct contact with plumbing, ductwork, floor joists, wall studs, floors, and walls. When running refrigerant lines through a foundation or wall, openings should allow for sound and vibration absorbing material to be placed or installed between tubing and foundation. Any gap between foundation or wall and refrigerant lines should be filled with a pliable silicon-based caulk, RTV or a vibration damping material. Avoid suspending refrigerant tubing from joists and studs with rigid wire or straps that would come in contact with the tubing. Use an insulated or suspension type hanger. Keep both lines separate and always insulate the suction line.

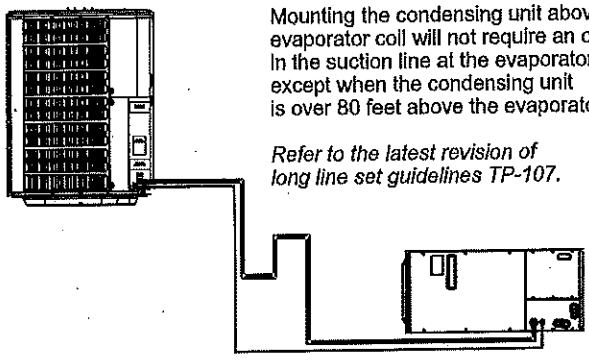
These sizes are recommended for line lengths of 79 feet or less to obtain optimum performance. For alternate line sizing options or runs of more than 79 feet, refer to Remote Cooling Service Manual or TP-107 Long Line Set Application R-410A or contact your distributor for assistance.

RECOMMENDED INTERCONNECTING TUBING (Ft)						
Cond Unit Tons	0-24		25-49		50-79*	
	Line Diameter (In. OD)					
	Suct	Liq	Suct	Liq	Suct	Liq
1 1/2	5/8	1/4	3/4	3/8	3/4	3/8
2	5/8	1/4	3/4	3/8	3/4	3/8
2 1/2	5/8	1/4	3/4	3/8	7/8	3/8
3	3/4	3/8	7/8	3/8	1 1/8	3/8
3 1/2	7/8	3/8	1 1/8	3/8	1 1/8	3/8
4	7/8	3/8	1 1/8	3/8	1 1/8	3/8
5	7/8	3/8	1 1/8	3/8	1 1/8	3/8

* Lines greater than 79 feet in length or vertical elevation changes more than 50 feet **refer to the Remote Cooling Service Manual or contact your distributor for assistance.**



Mounting the evaporator coil above the condensing unit will require an inverted loop in the suction line adjacent or near the connection to the evaporator. The top of the loop must be slightly higher than the top of the coil.



Mounting the condensing unit above the evaporator coil will not require an oil trap in the suction line at the evaporator, except when the condensing unit is over 80 feet above the evaporator.

Refer to the latest revision of long line set guidelines TP-107.

Insulation is necessary to prevent condensation from forming and dropping from the suction line. Armflex (or satisfactory equivalent) with 3/8" min. wall thickness is recommended. In severe conditions (hot, high humidity areas) 1/2" insulation may be required. Insulation must be installed in a manner which protects tubing from damage and contamination.

Where possible, drain as much residual compressor oil from existing systems, lines, and traps; pay close attention to low areas where oil may collect. **NOTE:** If changing refrigerant types, ensure the indoor coil and metering device is compatible with the type of refrigerant being used; otherwise, the indoor coil must be replaced.

Burying Refrigerant Lines

If burying refrigerant lines can not be avoided, use the following checklist.

1. Insulate liquid and suction lines separately.
2. Enclose all underground portions of the refrigerant lines in waterproof material (conduit or pipe) sealing the ends where tubing enters/exits the enclosure.
3. If the lines must pass under or through a concrete slab, ensure lines are adequately protected and sealed.

Refrigerant Line Connections

IMPORTANT

To avoid overheating the service valve, TXV valve, or filter drier while brazing, wrap the component with a wet rag, or use a thermal heat trap compound. Be sure to follow the manufacturer's instruction when using the heat trap compound. Note: Remove Schrader valves from service valves before brazing tubes to the valves. Use a brazing alloy of 2% minimum silver content. Do not use flux.

Torch heat required to braze tubes of various sizes is proportional to the size of the tube. Tubes of smaller size require less heat to bring the tube to brazing temperature before adding brazing alloy. Applying too much heat to any tube can melt the tube. Service personnel must use the appropriate heat level for the size of the tube being brazed. Note: The use of a heat shield when brazing is recommended to avoid burning the serial plate or the finish on the unit.

1. The ends of the refrigerant lines must be cut square, deburred, cleaned, and be round and free from nicks or dents. Any other condition increases the chance of a refrigerant leak.

2. "Sweep" the refrigerant line with nitrogen or inert gas during brazing to prevent the formation of copper-oxide inside the refrigerant lines. The POE oils used in R-410A applications will clean any copper-oxide present from the inside of the refrigerant lines and spread it throughout the system. This may cause a blockage or failure of the metering device.
3. After brazing, quench the joints with water or a wet cloth to prevent overheating of the service valve.
4. Ensure the filter drier paint finish is intact after brazing. If the paint of the steel filter drier has been burned or chipped, repaint or treat with a rust preventative. This is especially important on suction line filter driers which are continually wet when the unit is operating.

NOTE: Be careful not to kink or dent refrigerant lines. Kinked or dented lines will cause poor performance or compressor damage.

Do NOT make final refrigerant line connection until plugs are removed from refrigerant tubing.

NOTE: Before brazing, verify indoor piston size by checking the piston kit chart packaged with indoor unit.

Leak Testing (Nitrogen or Nitrogen-Traced)

⚠ WARNING

To avoid the risk of fire or explosion, never use oxygen, high pressure air or flammable gases for leak testing of a refrigeration system.

⚠ WARNING

To avoid possible explosion, the line from the nitrogen cylinder must include a pressure regulator and a pressure relief valve. The pressure relief valve must be set to open at no more than 150 psig.

Pressure test the system using dry nitrogen and soapy water to locate leaks. If you wish to use a leak detector, charge the system to 10 psi using the appropriate refrigerant then use nitrogen to finish charging the system to working pressure then apply the detector to suspect areas. If leaks are found, repair them. After repair, repeat the pressure test. If no leaks exist, proceed to system evacuation.

System Evacuation

Condensing unit liquid and suction valves are closed to contain the charge within the unit. The unit is shipped with the valve stems closed and caps installed. **Do not open valves until the system is evacuated.**

⚠ WARNING

REFRIGERANT UNDER PRESSURE!
Failure to follow proper procedures may cause property damage, personal injury or death.

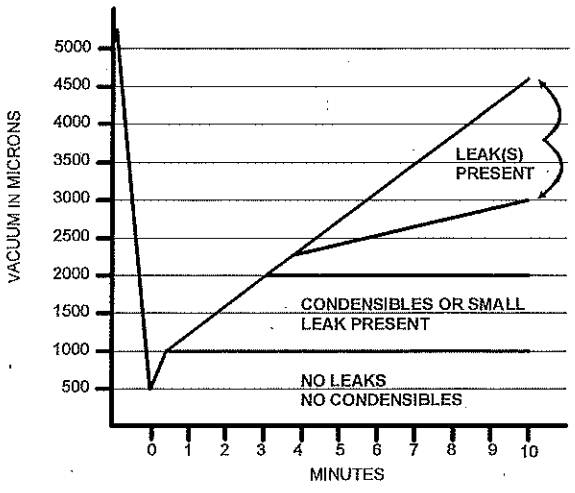
NOTE: Scroll compressors should never be used to evacuate or pump down a heat pump or air conditioning system.

⚠ CAUTION

Prolonged operation at suction pressures less than 20 psig for more than 5 seconds will result in overheating of the scrolls and permanent damage to the scroll tips, drive bearings and internal seal.

1. Connect the vacuum pump with 250 micron capability to the service valves.
2. Evacuate the system to 250 microns or less using suction **and** liquid service valves. Using both valves is necessary as some compressors create a mechanical seal separating the sides of the system.
3. Close pump valve and hold vacuum for 10 minutes. Typically pressure will rise during this period.

- If the pressure rises to 1000 microns or less and remains steady the system is considered leak-free; proceed to startup.



- If pressure rises above 1000 microns but holds steady below 2000 microns, moisture and/or noncondensibles may be present or the system may have a small leak. Return to step 2: If the same result is encountered check for leaks as previously indicated and repair as necessary then repeat evacuation.
- If pressure rises above 2000 microns, a leak is present. Check for leaks as previously indicated and repair as necessary then repeat evacuation.

Electrical Connections

⚠ WARNING

HIGH VOLTAGE!

Disconnect ALL power before servicing. Multiple power sources may be present. Failure to do so may cause property damage, personal injury or death due to electric shock. Wiring must conform with NEC or CEC and all local codes. Undersized wires could cause poor equipment performance, equipment damage or fire.

⚠ WARNING

To avoid the risk of fire or equipment damage, use copper conductors.

NOTICE

Units with reciprocating compressors and non-bleed TXV's require a Hard Start Kit.

The condensing unit rating plate lists pertinent electrical data necessary for proper electrical service and overcurrent protection. Wires should be sized to limit voltage drop to 2% (max.) from the main breaker or fuse panel to the condensing unit. Consult the NEC, CEC, and all local codes to determine the correct wire gauge and length.

Local codes often require a disconnect switch located near the unit; do not install the switch on the unit. Refer to the installation instructions supplied with the indoor furnace/air handler for specific wiring connections and indoor unit configuration. Likewise, consult the instructions packaged with the thermostat for mounting and location information.

Overcurrent Protection

The following overcurrent protection devices are approved for use.

- Time delay fuses
- HACR type circuit breakers

These devices have sufficient time delay to permit the motor-compressor to start and accelerate its load.

Three Phase Compressor Rotation

⚠ CAUTION

Use care when handling scroll compressors. Dome temperatures could be hot.

Three phase compressors are power phase dependent and can rotate in either direction.

Verify proper rotation for three phase compressors by ensuring the suction pressure drops and discharge pressure rises when the compressor is energized. **NOTE:** When operated in reverse, a three phase scroll compressors is noisier and its current draw substantially reduced compared to marked values.

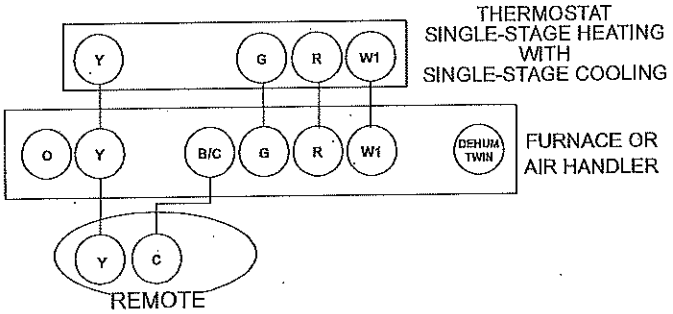
To correct, disconnect power and switch any two leads at the unit contactor and re-observe.

High Voltage Connections

Route power supply and ground wires through the high voltage port and terminate in accordance with the wiring diagram provided inside the control panel cover.

Low Voltage Connections

Condensing unit control wiring requires 24 Volt minimum, 25VA service from the indoor transformer. Low voltage wiring for two-stage units depends on the thermostat used and the number of control wires between the indoor unit and the condensing unit. Route control wires through the low voltage port and terminate in accordance with the wiring diagram provided inside the control panel cover.



Single-Stage Thermostat with Two Low Voltage Wires to Remote

System Start Up

CAUTION

POSSIBLE REFRIGERANT LEAK
To avoid a possible refrigerant leak, open the service valves until the top of the stem is 1/8" from the retainer.

When opening valves with retainers, open each valve only until the top of the stem is 1/8" from the retainer. To avoid loss of refrigerant, DO NOT apply pressure to the retainer. When opening valves without a retainer remove service valve cap and insert a hex wrench into the valve stem and back out the stem by turning the hex wrench counterclockwise. Open the valve until it contacts the rolled lip of the valve body.

NOTE: These are not back-seating valves. It is not necessary to force the stem tightly against the rolled lip.

NOTE: Power must be supplied to the 18 SEER outdoor units containing ECM motors before the power is applied to the indoor unit. Sending a low voltage signal without high voltage power present at the outdoor unit can cause malfunction of the control module on the ECM motor.

Adequate refrigerant charge for the matching HSVTC evaporator coil and 15 feet of lineset is supplied with the condensing unit. If using evaporator coils other than HSVTC coil, it may be necessary to add or remove refrigerant to attain proper charge. If line set exceeds 15 feet in length, refrigerant should be added at .6 ounces per foot of liquid line.

NOTE: Charge should always be checked using superheat when using a piston and subcooling when using TXV equipped indoor coil to verify proper charge.

Open the suction service valve first! If the liquid service valve is opened first, oil from the compressor may be drawn into the indoor coil TXV, restricting refrigerant flow and affecting operation of the system.

After the refrigerant charge has bled into the system, open the liquid service valve. The service valve cap is the secondary seal for the valves and must be properly tightened to prevent leaks. Make sure cap is clean and apply refrigerant oil to threads and sealing surface on inside of cap. Tighten cap finger-tight and then tighten additional 1/6 of a turn (1 wrench flat), or to the following specification, to properly seat the sealing surfaces.

1. 3/8" valve to 5 - 10 in-lbs
2. 5/8" valve to 5 - 20 in-lbs
3. 3/4" valve to 5 - 20 in-lbs
4. 7/8" valve to 5 - 20 in-lbs

Do not introduce liquid refrigerant from the cylinder into the crankcase of the compressor as this may damage the compressor.

CAUTION

POSSIBLE REFRIGERANT LEAK
To avoid a possible refrigerant leak, open the service valves until the top of the stem is 1/8" from the retainer.

1. Break vacuum by fully opening liquid and suction base valves.
2. Set thermostat to call for cooling. Check indoor and outdoor fan operation and allow system to stabilize for 10 minutes for fixed orifices and 20 minutes for expansion valves.

Charge Verification

WARNING

REFRIGERANT UNDER PRESSURE!
- **Do not overcharge system with refrigerant.**
- **Do not operate unit in a vacuum or at negative pressure.**

Failure to follow proper procedures may cause property damage, personal injury or death.

CAUTION

Use refrigerant certified to AHRI standards. Used refrigerant may cause compressor damage. Most portable machines cannot clean used refrigerant to meet AHRI standards.

NOTICE

Violation of EPA regulations may result in fines or other penalties.

CAUTION

Operating the compressor with the suction valve closed will void the warranty and cause serious compressor damage.

Final Charge Adjustment

The outdoor temperature must be 60°F or higher. Set the room thermostat to COOL, fan switch to AUTO, and set the temperature control well below room temperature.

After system has stabilized per startup instructions, check subcooling and superheat as detailed in the following section.

Fixed Orifice

⚠ CAUTION

To prevent personal injury, carefully connect and disconnect manifold gauge hoses. Escaping liquid refrigerant can cause burns. Do not vent refrigerant into the atmosphere. Recover all refrigerant during system repair and before final unit disposal.

1. Purge gauge lines. Connect service gauge manifold to base-valve service ports. Run system at least 10 minutes to allow pressure to stabilize.
2. Temporarily install a thermometer 4-6" from the compressor on the suction line. Ensure the thermometer makes adequate contact and is insulated for best possible readings. Use vapor temperature to determine superheat.
3. Refer to the superheat table provided for proper system superheat. Add charge to lower superheat or recover charge to raise superheat.
4. Disconnect manifold set, installation is complete.

Superheat Formula = Suct. Line Temp. - Sat. Suct. Temp.

SYSTEM SUPERHEAT									
Outdoor Dry Bulb Temperature, °F	Indoor Wet Bulb Temperature, °F								
	55	57	59	61	63	65	67	69	71
60	10	13	17	20	23	26	29	30	31
65	8	11	14	16	19	22	26	27	29
70	5	8	10	13	15	19	23	24	25
75	---	---	6	9	11	15	20	21	23
80	---	---	---	---	7	12	17	18	20
85	---	---	---	---	---	8	13	15	16
90	---	---	---	---	---	5	10	11	13
95	---	---	---	---	---	---	5	8	10
100	---	---	---	---	---	---	---	5	8
105	---	---	---	---	---	---	---	---	5
110	---	---	---	---	---	---	---	---	---
115	---	---	---	---	---	---	---	---	---

SUPERHEAT FORMULA = SUCT. LINE TEMP. - SAT. SUCT. TEMP.

SATURATED SUCTION PRESSURE TEMPERATURE CHART		
SUCTION PRESSURE	SATURATED SUCTION TEMPERATURE °F	
PSIG	R-22	R-410A
50	26	1
52	28	3
54	29	4
56	31	6
58	32	7
60	34	8
62	35	10
64	37	11
66	38	13
68	40	14
70	41	15
72	42	16
74	44	17
76	45	19
78	46	20
80	48	21
85	50	24
90	53	26
95	56	29
100	59	31
110	64	36
120	69	41
130	73	45
140	78	49
150	83	53
160	86	56
170	90	60

SATURATED LIQUID PRESSURE TEMPERATURE CHART		
LIQUID PRESSURE	SATURATED LIQUID TEMPERATURE °F	
PSIG	R-22	R-410A
200	101	70
210	105	73
220	108	76
225	110	78
235	113	80
245	116	83
255	119	85
265	121	88
275	124	90
285	127	92
295	130	95
305	133	97
325	137	101
355	144	108
375	148	112
405	155	118
415	157	119
425	n/a	121
435	n/a	123
445	n/a	125
475	n/a	130
500	n/a	134
525	n/a	138
550	n/a	142
575	n/a	145
600	n/a	149
625	n/a	152

NOTE: SPECIFICATIONS AND PERFORMANCE DATA LISTED HEREIN ARE SUBJECT TO CHANGE WITHOUT NOTICE.

Expansion Valve System

NOTE: Units matched with indoor coils equipped with non-adjustable TXV should be charged by subcooling only.

1. Purge gauge lines. Connect service gauge manifold to base-valve service ports. Run system at least 10 minutes to allow pressure to stabilize.
2. Temporarily install a thermometer on the liquid line at the liquid line service valve and 4-6" from the compressor on the suction line. Ensure the thermometer makes adequate contact and is insulated for best possible readings. Use liquid line temperature to determine sub-cooling and vapor temperature to determine superheat.
3. Check subcooling and superheat. Systems with TXV application should have a subcooling of 7 to 9 °F and superheat of 7 to 9 °F.
   a. If subcooling and superheat are low, **adjust** TXV to 7 to 9 °F superheat, then check subcooling.

      NOTE: To adjust superheat, turn the valve stem clockwise to increase and counter clockwise to decrease.

   b. If subcooling is low and superheat is high, **add** charge to raise subcooling to 7 to 9 °F then check superheat.
   c. If subcooling and superheat are high, **adjust** TXV valve to 7 to 9 °F superheat, then check subcooling.
   d. If subcooling is high and superheat is low, **adjust** TXV valve to 7 to 9 °F superheat and **remove** charge to lower the subcooling to 7 to 9 °F.

   NOTE: Do **NOT** adjust the charge based on suction pressure unless there is a gross undercharge.
4. Disconnect manifold set, installation is complete.

Subcooling Formula = Sat. Liquid Temp. - Liquid Line Temp.

NOTE: Check the Schrader ports for leaks and tighten valve cores if necessary. Install caps finger-tight.

Troubleshooting Information

Complaint	No Cooling							Unsatisfactory Cooling					System Operating Pressures				Test Method Remedy
POSSIBLE CAUSE DOTS IN ANALYSIS GUIDE INDICATE "POSSIBLE CAUSE" SYMPTOM	System will not start	Compressor will not start - fan runs	Compressor and Condenser Fan will not start	Evaporator fan will not start	Condenser fan will not start	Compressor runs - goes off on overload	Compressor cycles on overload	System runs continuously - little cooling	Too cool and then too warm	Not cool enough on warm days	Certain areas to cool others to warm	Compressor is noisy	Low suction pressure	Low head pressure	High suction pressure	High head pressure	
Power Failure	•																Test Voltage
Blown Fuse	•		•	•													Impact Fuse Size & Type
Loose Connection	•			•	•	•											Inspect Connection - Tighten
Shorted or Broken Wires	•	•	•	•	•	•											Test Circuits with Ohmmeter
Open Overload				•	•												Test Continuity of Overloads
Faulty Thermostat	•		•	•					•								Test Continuity of Thermostat and Wiring
Faulty Transformer	•		•														Check Control Circuit with Voltmeter
Shorted or Open Capacitor		•		•	•	•											Test Capacitor
Internal Compressor Overload Open		•															Test Continuity of Overload
Shorted or Grounded Compressor		•				•											Test Motor Windings
Compressor Stuck	•					•											Use Test Cord
Faulty Compressor Contactor	•	•	•			•											Test Continuity of Coil and Contacts
Faulty Fan Relay				•													Test Continuity of Coil and Contacts
Open Control Circuit																	Test Control Circuit with Voltmeter
Low Voltage		•				•	•										Test Voltage
Faulty Evaporator Fan Motor				•									•				Repair or Replace
Shorted or Grounded Fan Motor				•	•											•	Test Motor Windings
Improper Cooling Anticipator									•								Check Resistance of Anticipator
Shortage or Refrigerant							•	•					•	•			Test For Leaks, Add Refrigerant
Restricted Liquid Line							•	•					•	•			Replace Restricted Part
Undersized Liquid Line								•		•			•				Replace Line
Undersized Suction Line													•				Replace Line
Not Enough Air across Indoor Coil								•		•	•		•				Speed Blower, Check Duct Static Pressure
Too Much Air across Indoor Coil															•		Reduce Blower Speed
Overcharge of Refrigerant						•	•					•			•	•	Recover Part of Charge
Noncondensibles							•			•						•	Recover Charge, Evacuate, Recharge
Recirculation of Condensing Air							•			•						•	Remove Obstruction to Air Flow
Infiltration of Outdoor Air								•		•	•						Check Windows, Doors, Vent Fans, Etc.
Improperly Located Thermostat									•								Relocate Thermostat
Air Flow Unbalanced									•		•						Readjust Air Volume Dampers
System Undersized								•		•							Refigure Cooling Load
Broken Internal Parts												•					Replace Compressor
Broken Valves												•					Test Compressor Efficiency
Inefficient Compressor								•						•	•		Test Compressor Efficiency
High Pressure Control Open			•														Reset and Test Control
Unbalanced Power, 3PH		•				•	•										Test Voltage
Wrong Type Expansion Valve						•	•			•							Replace Valve
Expansion Valve Restricted						•	•	•		•			•	•			Replace Valve
Oversized Expansion Valve												•			•		Replace Valve
Undersized Expansion Valve						•	•	•		•			•				Replace Valve
Expansion Valve Bulb Loose												•			•		Tighten Bulb Bracket
Inoperative Expansion Valve						•		•					•				Check Valve Operation
Loose Hold-down Bolts												•					Tighten Bolts

For detailed service information refer to the Remote Condensing Unit Service manual.

NOTICE

Units with rotary or reciprocating compressors and non-bleed TXV's require a Hard Start Kit.

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SPLIT SYSTEMS

AIR CONDITIONING AND HEAT PUMP HOMEOWNER'S ROUTINE MAINTENANCE RECOMMENDATIONS

We strongly recommend a bi-annual maintenance checkup be performed before the heating and cooling seasons begin by a ***qualified servicer****.*

Replace or Clean Filter

IMPORTANT NOTE: Never operate unit without a filter installed as dust and lint will build up on internal parts resulting in loss of efficiency, equipment damage and possible fire.

An indoor air filter must be used with your comfort system. A properly maintained filter will keep the indoor coil of your comfort system clean. A dirty coil could cause poor operation and/or severe equipment damage.

Your air filter or filters could be located in your furnace, in a blower unit, or in "filter grilles" in your ceiling or walls. The installer of your air conditioner or heat pump can tell you where your filter(s) are, and how to clean or replace them.

Check your filter(s) at least once a month. When they are dirty, replace or clean as required. Disposable type filters should be replaced. Reusable type filters may be cleaned.

You may want to ask your dealer about high efficiency filters. High efficiency filters are available in both electronic and non-electronic types. These filters can do a better job of catching small airborne particles.

Compressor

The compressor motor is hermetically sealed and does not require additional oiling.

Motors

Indoor and outdoor fan motors are permanently lubricated and do not require additional oiling.

Clean Outside Coil (Qualified Servicer Only)

⚠ WARNING

HIGH VOLTAGE!

DISCONNECT ALL POWER BEFORE SERVICING. MULTIPLE POWER SOURCES MAY BE PRESENT. FAILURE TO DO SO MAY CAUSE PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

Air must be able to flow through the outdoor unit of your comfort system. Do not construct a fence near the unit or build a deck or patio over the unit without first discussing your plans with your dealer or other qualified servicer. Restricted airflow could lead to poor operation and/or severe equipment damage.

Likewise, it is important to keep the outdoor coil clean. Dirt, leaves, or debris could also restrict the airflow. If cleaning of the outdoor coil becomes necessary, hire a qualified servicer. Inexperienced people could easily puncture the tubing in the coil. Even a small hole in the tubing could eventually cause a large loss of refrigerant. Loss of refrigerant can cause poor operation and/or severe equipment damage.

Do not use a condensing unit cover to "protect" the outdoor unit during the winter, unless you first discuss it with your dealer. Any cover used must include "breathable" fabric to avoid moisture buildup.

Before Calling Your Servicer

- Check the thermostat to confirm that it is properly set.
- Wait 15 minutes. Some devices in the outdoor unit or in programmable thermostats will prevent compressor operation for awhile, and then reset automatically. Also, some power companies will install devices which shut off air conditioners for several minutes on hot days. If you wait several minutes, the unit may begin operation on its own.

⚠ CAUTION

TO AVOID THE RISK OF EQUIPMENT DAMAGE OR FIRE, INSTALL THE SAME AMPERAGE BREAKER OR FUSE AS YOU ARE REPLACING. IF THE CIRCUIT BREAKER OR FUSE SHOULD OPEN AGAIN WITHIN THIRTY DAYS, CONTACT A QUALIFIED SERVICER TO CORRECT THE PROBLEM.
IF YOU REPEATEDLY RESET THE BREAKER OR REPLACE THE FUSE WITHOUT HAVING THE PROBLEM CORRECTED, YOU RUN THE RISK OF SEVERE EQUIPMENT DAMAGE.

- Check the electrical panel for tripped circuit breakers or failed fuses. Reset the circuit breakers or replace fuses as necessary.
- Check the disconnect switch near the indoor furnace or blower to confirm that it is closed.
- Check for obstructions on the outdoor unit. Confirm that it has not been covered on the sides or the top. Remove any obstruction that can be safely removed. If the unit is covered with dirt or debris, call a qualified servicer to clean it.
- Check for blockage of the indoor air inlets and outlets. Confirm that they are open and have not been blocked by objects (rugs, curtains or furniture).
- Check the filter. If it is dirty, clean or replace it.
- Listen for any unusual noise(s), other than normal operating noise, that might be coming from the outdoor unit. If you hear unusual noise(s) coming from the unit, call a qualified servicer.

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